

IN THE CLAIMS

Applicant amends the Claims as follows:

1. (Original) A method of vacating a portion of a photoceram, the method comprising,

generating a laser beam at a predetermined wavelength within a weak absorption region of the photoceram,

focusing the laser beam into a beam waist at a focal depth into the photoceram,

illuminating the photoceram by the laser beam to expose a focal volume of the photoceram at a focal depth where the laser beam converts the photoceram into an amorphous exposed material in the focal volume,

heating the amorphous exposed material for forming crystallized material from the amorphous exposed material in the focal volume, and

dissolving the crystallized material in an acid for evacuating crystallized material from the focal volume and creating a focal volume vacancy defining the portion.

2. (Original) The method of claim 1 wherein,

the portion serves to suspend another portion of the photoceram.

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1 3. (Original) The method of claim 1 wherein,

2 the portion serves to undercut another portion of the
3 photoceram.

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5 4. (Original) A method of forming a three dimensional embedded
6 structure in a photoceram, the method comprising,

7 generating a laser beam at a predetermined wavelength within a
8 weak absorption region of the photoceram,

9 focusing the laser beam into a beam waist at a focal depth into
10 the photoceram,

11 illuminating the photoceram by the laser beam to expose a focal
12 volume of the photoceram at a focal depth where the laser beam
13 converts the photoceram into an amorphous exposed material in the
14 focal volume,

15 heating the amorphous exposed material for forming crystallized
16 material from the amorphous exposed material in the focal volume,
17 and

18 dissolving the crystallized material in an acid for evacuating
19 crystallized material from the focal volume and creating a focal
20 volume vacancy defining the three dimensional embedded structure.

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23 5. (Currently Amended) The method of claim 4 wherein,

24 the photoceram is ~~Feturan~~ a lithium aluminosilicate
25 photostructable glass ceramic material, and

26 the predetermined wavelength is greater than 350nm.

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1 6. (Original) The method of claim 4 wherein,

2 the predetermined wavelength is an ultraviolet wavelength.

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4 7. (Original) The method of claim 4 wherein the illuminating step
5 comprises the steps of,

6 exposing the photoceram at the predetermined wavelength for a
7 predetermined number of pulses to provide a critical dose at the
8 focal depth for creating a pixelized volume of amorphous exposed
9 material,

10 moving the photoceram a predetermined step distance relative
11 to the laser beam, and

12 repeating the exposing and moving step a plurality of times
13 for creating a respective plurality of pixelized volumes forming
14 the focal volume.

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16 8. (Original) The method of claim 7 wherein,

17 the predetermined number of pulses is between 100 and 10000
18 for delivering the critical dose for converting the photoceram into
19 the amorphous exposed material.

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1 9. (Original) The method of claim 4 wherein the dissolving steps 4
2 further comprising the steps of,

3 forming a top via in the photoceram for communicating the acid
4 into the focal volume for dissolving the crystalline material in
5 the focal volume,

6 dissolving the crystalline material in the focal volume with
7 the acid communicated into the focal volume through the top via,

8 forming a bottom via in the photoceram for vacating dissolved
9 crystalline material out of the focal volume, and

10 vacating the dissolved crystalline material through the bottom
11 via.

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13 10. (Original) The method of claim 9 wherein the forming steps for
14 forming the top and bottom via comprise the steps of,

15 exposing the photoceram in a top region for creating a top via
16 volume of amorphous expose material for defining the top via,

17 exposing the photoceram in a bottom region for creating a
18 bottom via volume of amorphous expose material for defining the
19 bottom via, the baking step serving to bake the amorphous exposed
20 material in the top and bottom via volumes into crystallized
21 material, the dissolving step serving to dissolve the crystallized
22 material out of the top and bottom volumes for forming the top via
23 and bottom vias.

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1 11. (Original) The method of claim 4 wherein,

2 the illumination step exposes the focal volume during an
3 exposure time at an intensity level,

4 the intensity level and the exposure time provide an exposure
5 dose above a minimum critical dose necessary for converting the
6 photoceram into the amorphous exposed material, and

7 the minimum critical dose is a nonlinear function of the
8 intensity level.

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10 12. (Original) The method of claim 4 wherein,

11 the laser is a pulsed laser,

12 the laser beam is a pulsed laser beam having a predetermined
13 number of pulses,

14 the illumination step exposes the focal volume for the
15 predetermined number of pulses having a per pulse fluence level
16 over a predetermined pulse width time,

17 the per pulse fluence level and the predetermined number of
18 pulses provide an exposure dose above a minimum critical dose
19 necessary for converting the photoceram into the amorphous exposed
20 material, and

21 the minimum critical dose is a nonlinear function of the per
22 pulse fluence level.

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1 13. (Original) A method of forming a three dimensional embedded
2 structure in a photoceram, the method comprising,
3 generating a pulsed laser beam at a UV wavelength within a weak
4 absorption band of the photoceram,
5 focusing the laser beam into a beam waist at a focal depth into
6 the photoceram,
7 exposing the photoceram at the UV wavelength a predetermined
8 number of pulses at focal depth for creating a pixelized volume of
9 amorphous exposed material,
10 moving the photoceram a predetermined step distance, and
11 repeating the exposing and moving step a plurality of times
12 for creating a respective plurality of pixelized volume forming a
13 focal volume,
14 heating the photoceram to heat the amorphous exposed material
15 in the focal volume to bake the amorphous material into a
16 crystallized material, and
17 dissolving the crystallized material in an acid for evacuating
18 the crystallized material from the focal volume creating a focal
19 volume vacancy defining the three dimensional embedded structure.

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21 14. (Currently Amended) The method of claim 13 wherein,
22 the photoceram is ~~Feturan~~ a lithium aluminosilicate
23 photostructable glass ceramic material,
24 the ultraviolet wavelength is 355nm, and
25 the number of pulses is between 100 and 10000.

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- 1 15. (Original) The method of claim 13 wherein,
2 all the steps are repeated for forming a plurality of
3 embedded structures.
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- 5 16. (Original) The method of claim 13 wherein the embedded
6 structure is an undercut structure.
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- 8 17. (Original) The method of claim 13 further comprising the step
9 of,
10 agitating the acid for transporting the acid through the top
11 via into the focal volume.
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- 13 18. (Original) The method of claim 13 further comprising the step
14 of,
15 pressurizing the acid for transporting the acid through the
16 top via into the focal volume.
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- 18 19. (Original) The method of claim 13 wherein the illumination
19 laser beam has a Gaussian profile and is focused at the focal depth
20 in the photoceram.
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1 20. (Original) The method of claim 13 wherein,
2 the UV wavelength is at an edge between the weak absorption
3 region and the strong absorption region of the photoceram,
4 the illumination step exposes the focal volume for the
5 predetermined number of pulses having a per pulse fluence level
6 over a predetermined pulse width time,
7 the per pulse fluence level and the predetermined number of
8 pulses provide an exposure dose above a minimum critical dose
9 necessary for converting the photoceram into the amorphous exposed
10 material, and
11 the minimum critical dose is a nonlinear function of the per
12 pulse fluence level.

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